

What is claimed is:

Sub
A14

1. A method of sorting out defect-free workpieces blanked out of a metal sheet, comprising the steps of:

inserting the workpieces into a passage having a predetermined width to sort out those workpieces which have passed through said passage;

analyzing respective images of the workpieces which have passed through said passage to compare the images with a reference workpiece image, reject workpieces which have a portion different from said reference workpiece image, and sort out other workpieces; and

applying a gage having a shape complementary to a required shape for a functional portion of the workpieces, to the workpieces which have been sorted out, and sorting out those workpieces whose functional portion has a shape complementary to the shape of said gage, as defect-free workpieces.

2. A method according to claim 1, wherein said step of analyzing respective images of the workpieces inserted into the passage comprises the steps of:

converting the images of the workpieces into respective binary images each having a predetermined number of pixels in a unit area, comparing the binary images with said reference workpiece image, reject workpieces which

1000 999 998 997 996
995 994 993 992 991
990 989 988 987 986
985 984 983 982 981
980 979 978 977 976
975 974 973 972 971
970 969 968 967 966
965 964 963 962 961
960 959 958 957 956
955 954 953 952 951
950 949 948 947 946
945 944 943 942 941
940 939 938 937 936
935 934 933 932 931
930 929 928 927 926
925 924 923 922 921
920 919 918 917 916
915 914 913 912 911
910 909 908 907 906
905 904 903 902 901
900 899 898 897 896
895 894 893 892 891
890 889 888 887 886
885 884 883 882 881
880 879 878 877 876
875 874 873 872 871
870 869 868 867 866
865 864 863 862 861
860 859 858 857 856
855 854 853 852 851
850 849 848 847 846
845 844 843 842 841
840 839 838 837 836
835 834 833 832 831
830 829 828 827 826
825 824 823 822 821
820 819 818 817 816
815 814 813 812 811
810 809 808 807 806
805 804 803 802 801
800 799 798 797 796
795 794 793 792 791
790 789 788 787 786
785 784 783 782 781
780 779 778 777 776
775 774 773 772 771
770 769 768 767 766
765 764 763 762 761
760 759 758 757 756
755 754 753 752 751
750 749 748 747 746
745 744 743 742 741
740 739 738 737 736
735 734 733 732 731
730 729 728 727 726
725 724 723 722 721
720 719 718 717 716
715 714 713 712 711
710 709 708 707 706
705 704 703 702 701
700 699 698 697 696
695 694 693 692 691
690 689 688 687 686
685 684 683 682 681
680 679 678 677 676
675 674 673 672 671
670 669 668 667 666
665 664 663 662 661
660 659 658 657 656
655 654 653 652 651
650 649 648 647 646
645 644 643 642 641
640 639 638 637 636
635 634 633 632 631
630 629 628 627 626
625 624 623 622 621
620 619 618 617 616
615 614 613 612 611
610 609 608 607 606
605 604 603 602 601
600 599 598 597 596
595 594 593 592 591
590 589 588 587 586
585 584 583 582 581
580 579 578 577 576
575 574 573 572 571
570 569 568 567 566
565 564 563 562 561
560 559 558 557 556
555 554 553 552 551
550 549 548 547 546
545 544 543 542 541
540 539 538 537 536
535 534 533 532 531
530 529 528 527 526
525 524 523 522 521
520 519 518 517 516
515 514 513 512 511
510 509 508 507 506
505 504 503 502 501
500 499 498 497 496
495 494 493 492 491
490 489 488 487 486
485 484 483 482 481
480 479 478 477 476
475 474 473 472 471
470 469 468 467 466
465 464 463 462 461
460 459 458 457 456
455 454 453 452 451
450 449 448 447 446
445 444 443 442 441
440 439 438 437 436
435 434 433 432 431
430 429 428 427 426
425 424 423 422 421
420 419 418 417 416
415 414 413 412 411
410 409 408 407 406
405 404 403 402 401
400 399 398 397 396
395 394 393 392 391
390 389 388 387 386
385 384 383 382 381
380 379 378 377 376
375 374 373 372 371
370 369 368 367 366
365 364 363 362 361
360 359 358 357 356
355 354 353 352 351
350 349 348 347 346
345 344 343 342 341
340 339 338 337 336
335 334 333 332 331
330 329 328 327 326
325 324 323 322 321
320 319 318 317 316
315 314 313 312 311
310 309 308 307 306
305 304 303 302 301
300 299 298 297 296
295 294 293 292 291
290 289 288 287 286
285 284 283 282 281
280 279 278 277 276
275 274 273 272 271
270 269 268 267 266
265 264 263 262 261
260 259 258 257 256
255 254 253 252 251
250 249 248 247 246
245 244 243 242 241
240 239 238 237 236
235 234 233 232 231
230 229 228 227 226
225 224 223 222 221
220 219 218 217 216
215 214 213 212 211
210 209 208 207 206
205 204 203 202 201
200 199 198 197 196
195 194 193 192 191
190 189 188 187 186
185 184 183 182 181
180 179 178 177 176
175 174 173 172 171
170 169 168 167 166
165 164 163 162 161
160 159 158 157 156
155 154 153 152 151
150 149 148 147 146
145 144 143 142 141
140 139 138 137 136
135 134 133 132 131
130 129 128 127 126
125 124 123 122 121
120 119 118 117 116
115 114 113 112 111
110 109 108 107 106
105 104 103 102 101
100 99 98 97 96
95 94 93 92 91
90 89 88 87 86
85 84 83 82 81
80 79 78 77 76
75 74 73 72 71
70 69 68 67 66
65 64 63 62 61
60 59 58 57 56
55 54 53 52 51
50 49 48 47 46
45 44 43 42 41
40 39 38 37 36
35 34 33 32 31
30 29 28 27 26
25 24 23 22 21
20 19 18 17 16
15 14 13 12 11
10 9 8 7 6
5 4 3 2 1

SEARCHED
INDEXED
SERIALIZED
FILED

have a portion different from said reference workpiece image, and sort out other workpieces.

3. A method of sorting out defect-free elements blanked out of a metal sheet, each having a body and a head joined to the body with a pair of recesses defined therebetween, the elements being stacked in a transverse direction thereof into an annular form and bundled together by an assembly of stacked endless metal rings inserted in said recesses into a belt for use in a continuously variable transmission, said method comprising the steps of:

inserting the elements into a passage having a predetermined width to sort out and deliver those elements which have passed through said passage to a feed path;

analyzing respective images of the elements which have been delivered to said feed path while in said feed path to compare the images with a reference element image, reject elements which have a portion different from said reference element image, and feed other elements;

stacking and arraying the fed elements in a transverse direction thereof downstream of said feed path; and

passing the arrayed elements through a gage having a shape complementary to a required shape for the recesses of the elements, and sorting out those elements which have passed through said gage as defect-free elements.

SEARCHED
INDEXED
SERIALIZED
FILED

4. A method according to claim 3, wherein said step of analyzing respective images of the elements comprises the steps of:

converting the images of the elements into respective binary images each having a predetermined number of pixels in a unit area, comparing the binary images with said reference element image, rejecting workpieces which have a portion different from said reference element image, and feeding other elements.

5. A method according to claim 3, wherein said portion different from said reference element image is either entrapped foreign matter, an outer profile deformation, or a defect.

6. A method according to claim 5, wherein said entrapped foreign matter comprises an abrasive particle used to grind an element.

7. A method according to claim 5, wherein said outer profile deformation comprises a partial broken-off region of an element.

8. A method according to claim 5, wherein said defect comprises a recesses in a surface of an element.